MOUPIYA MAJI

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SUMMARY

Astrophysicist with extensive research experience in galaxies, star clusters, radiation transfer, computational astrophysics, and statistical data analysis. I have an academic background in both physics and astrophysics and have taught several theoretical and practical undergraduate courses, along with supervising master's student projects. I am interested in developing a career that combines teaching and research while maintaining my interest in public outreach and science communications.

EDUCATION

Université de Genève, Geneva, Switzerland
PostDoctoral Researcher in Astronomy and Astrophysics *2018 - Now*

The Pennsylvania State University, University Park, PA, USA
Ph.D. in Astronomy and Astrophysics *2018*
M.S. in Astronomy and Astrophysics *2014*

Indian Institute of Science, Bangalore, India
M.S. in Physics, First class with Distinction *2012*

Presidency College, Calcutta University, Kolkata, India
B.S. in Physics, First class with Honors *2009*

RESEARCH EXPERIENCE

Université de Genève - PostDoctoral Research – *PI - Dr. Anne Verhamme* 2018 - Now

- Simulated the radiative transfer of lyman alpha photons from thousands of galaxies in the hydrodynamical cosmological simulation *SPHINX* using 3D RT code RASCAS, analyzed the datasets consisting physical and radiative properties of the galaxies and investigated the correlations between their ionizing radiation and other observable properties and predicted that bright lyman alpha emitting galaxies are the primary sources of reionization.
- Built predictive statistical models using multivariate linear regression and showed that it is possible to predict the contribution of a galaxy towards reionization with a high degree of accuracy given their observable physical properties and Lyman alpha emission; such models can be very useful for planning future observing missions.

The Pennsylvania State University - Ph.D. Research – *Advisor - Dr. Yuexing Li* 2012 - 2018

- Investigated the Illustris dataset (a 100 Mpc hydro-dynamical simulation of the Universe) to identify satellite systems around massive galaxies and investigate the evolution and statistical distribution of disk of satellites properties.
- Systematically explored observed Milky Way satellite data to understand the effect of undersampling on the anisotropy and kinematic coherence of satellite planes. Compared a baryonic and N-body simulation to demonstrate that hydrodynamical simulations can reproduce anisotropic satellite distributions.

- Studied the origin of the universal log-normal mass function in globular clusters by performing major galaxy merger simulations and explored the formation of massive star clusters in them that showed extreme high pressure clouds in highly shocked regions of mergers can produce massive star clusters with lognormal mass function which may evolve into globular clusters observed today.

Indian Institute of Science — Masters thesis – *Dr. Tarun Deep Saini* 2011 - 2012

- Developed theoretical models to determine the pattern speed of warped spiral galaxies and extract the 3D velocity field of a spiral galaxy given observations of its surface brightness and the line-of-sight velocities and tested it successfully on a numerically simulated galaxy.

Saha Institute of Nuclear Physics — Undergraduate Research Associate – *Dr. Tinku Sinha* 2009

- Analyzed data collected at the ALICE detector of the Large Hadron Collider in spring of 2009, calculated the electronic stability of MANAS chips used in the detector and found that there was no deformation in the data and the noise level is less than half of the accepted threshold.

GRANTS AND AWARDS

Co-I of the international JWST grant to "LyC22 - Deep spectroscopic insights on star-forming galaxies 2.2 Gyr after the Big Bang" James Webb Space Telescope (JWST) Cycle 1 proposal 2021
Research Travel Grant, Société Académique de Geneve, University of Geneva 2020
Co-I of international HST grant to "Star Clusters in Tidal Debris: A UV Survey of Stellar Populations, Galaxy Interactions, and Evolution" Hubble Space Telescope (HST) 2017
Zaccheus Daniel Fellowship, The Pennsylvania State University 2016, 2014
Homer F. Braddock and Nellie H. and Oscar L. Roberts Fellowships, PennState 2012
Junior Research Fellowship (JRF) from National Eligibility Test (NET), nationally ranked 36th 2011
Young Researcher Lindau Travel Award, to attend Lindau Nobel Laureates Meetings, India 2010

PUBLICATIONS

Maji, M., Verhamme, A., Garel, T., Blaizot, J., Roshdahl, J., Chuniaud, M., Michel-Dansac, L., Mauerhofer, V., Pittavino, M., Feser, M. *"Can we predict LyC emission of galaxies using their physical and Lymam alpha emission properties?"*, 2021, submitted to A&A (Astronomy and Astrophysics Journal)

Zhu, Q., Li, Y., Li, Yi., **Maji, M.**, Yajima, H., ; Schneider, R., Hernquist, L. *"The Formation of the First Quasars. I. The Black Hole Seeds, Accretion and Feedback Models"*, 2021, submitted to MNRAS (Monthly Notices of the Royal Astronomical Society Journal)

Li, Y., Gu, M., Yajima, H., Zhu, Q., **Maji, M.** *"ART^2: a 3D parallel multiwavelength radiative transfer code for continuum and atomic and molecular lines "*, 2020, MNRAS, 494, 1919. (Monthly Notices of the Royal Astronomical Society)

Maji, M., Zhu, Q., Marinacci, F. & Li, Y. *"Is There a Disk of Satellites around the Milky Way?"*, 2017, ApJ, 843, 62. (The Astrophysical Journal)

Maji, M., Zhu, Li, Y., Charlton, J., Hernquist, L. & Knebe, A. *"The Formation and Evolution of Star Clusters in Interacting Galaxies"*, 2017, ApJ, 844, 108. (The Astrophysical Journal)

Zhu, Q., Marinacci, F., **Maji, M.**, Li, Y., Springel, V. & Hernquist, L. *"Baryonic impact on the dark matter distribution in Milky Way-sized galaxies and their satellites"*, 2016, MNRAS, 458, 1559.(Monthly Notices of the Royal Astronomical Society)

TEACHING EXPERIENCE

Instructor Introductory Astronomy lab 2018, 2017, 2013, 2012
Taught the course on practical astronomy lab to undergraduate students ($\sim$ 25 in each class) for 4 semesters. The course objective was to understand astronomy concepts using computer softwares, workbooks, presentations and observations through telescopes and planetarium. Developed the curriculum, taught class weekly, guided them through nighttime telescope observations, and graded the course.

Telescope & **Planetarium Operator** Observational component of various courses 2018
Guided undergraduate students through telescope observations and delivered planetarium lectures few nights every week.

Teaching Assistant Astronomical Universe 2017, 2012
Teaching Assistant Life in the Universe 2013
Graded these undergraduate courses, and held regular office hours for students.

Guest Lecturer Stars and Galaxies, 2013
Guest Lecturer Stars, Galaxies, and the Universe 2012

ADVISING

Mentored two Masters Students for their semester long projects. Conceptualized the problems, generated the dataset for analysis by performing radiative transfer simulations and helped them with running simulations and statistical analysis.

Origin of extended lyman alpha emission - Will Ceva (Masters student, UniGe) 2021
Investigated the origin of extended Lyman alpha emission (Lya Halos) that is often observed in galaxies at early universe, especially around reionization by analyzing 50 simulated galaxies.

How lyman alpha emitting galaxies work - Jaime Roman Garza (Masters student, UniGe) 2020
Researched the impact of the inter-stellar medium (ISM) structure (covering fraction, column density etc) on the escape of the Lyman-alpha radiation from early galaxies.

COMPUTING SKILLS

Programming languages:	R, Python, C++, C, IDL, Fortran, Julia
Operating systems:	Unix/Linux, Macintosh OS X
Architecture:	Cluster computing, Parallel computing, GPU computing
Typesetting:	LaTeX

TALKS AND POSTERS

Maji, M. 'Predicting reionization sources using lyman alpha', Feb 2021, Contributed talk at *SPHINX-RASCAS-TRIPLE: A collaborative workshop on reionization and galaxy evolution*

Maji, M. 'Understanding cosmic reionization using Lyman Alpha emission', July 2020, Contributed talk at *SAZERAC : Summer all zoom epoch of reionization astronomy conference*

Maji, M. 'Understanding cosmic reionization using Lyman alpha line', June 2019, Contributed talk at *Zoom-In and Out: From the Interstellar Medium to the Large Scale Structure of the Universe*, NORDITA, Stockholm, Sweden

Maji, M. 'Radiative transfer of Lya emission from high-redshift quasars using ART2 code', March 2018, Contributed talk at *Walking the Line 2018*, Arizona State University, Arizona

Maji, M. 'Illuminating the star clusters and satellite galaxies with multi-scale baryonic simulations', January 2018, Contributed talk at *231st AAS meeting*, Washington DC

Maji, M. 'Multi Wavelength properties of first quasars and early galaxies', August 2017, Poster at *Spectral diagnostics to explore the cosmic dawn with JWST*, STSCI, Baltimore

Maji, M. 'Star formation history and evolution of local group dwarfs', July 2015, Poster at *Mocking the Universe*, STSCI, Baltimore

Maji, M. 'Formation and evolution of Disk of Satellites', June 2015, Poster at *Local Group Astro-Statistics*, University of Michigan, Ann Arbor

Maji, M. 'Dwarf galaxies around the Milky Way - Disk of Satellites', March 2015, Contributed talk at *Neighborhood Workshop on Astrophysics and Cosmology*, Penn State, PA

Maji, M. 'The formation and evolution of star clusters in galaxy mergers', June 2014, Contributed talk at 224^{th} *AAS meeting*, Boston

OUTREACH

City Wide exhibition by U. Geneva Observatory – *Volunteer* 2018

Volunteered in a major city-wide public exhibition organized by the University of Geneva Astronomy department. Made educational posters and presented them to groups of visitors.

Graduate Women in Science PennState Chapter – *Outreach Co-Chair* 2015 - 2016

Organized monthly outreach and science education events for general public and school students at different community locations and facilitated hand-on activities and science demonstrations.

Graduate Women in Science PennState Chapter – *Brown Bag Co-Chair* 2014 - 2015

Organized monthly seminars for graduate students focusing on professional development, selected and co-ordinated with speakers from campus faculty and career services.

Department student representative – *Climate and Diversity committee* 2014 - 2016

Helped organized department social events.

AstroFest in Penn State Astronomy Department – *Volunteer* 2013 - 2016

Volunteered in a major yearly 4 -day astronomy outreach event organized by Penn State Astronomy department. Delivered public talks on astronomy topics to groups of visitors.

Indian Institute of Science Open Day – *Astronomer Volunteer* 2011 - 2012

Organized yearly public outreach event for the astronomy section of the physics department in the institute. Demonstrated science experiments and gave short informal talks to public.

PERSONAL, INTERESTS AND HOBBIES

I am very interested in effective science communication, specifically writing popular science articles and developing videos on astronomy for general audiences in both Bengali and English.

I mentored groups of under-privileged students in Delhi through Freedom Employability Academy in 2019 and loved the experience, I plan to engage in more mentoring opportunities in India.

Avid fiction reader. Enthusiastic gardener. Amateur photographer.